Document-Level Decoding in Moses

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Problem of Lexical Consistency

Problem: inconsistent translation of words / phrases within a document

Input

con la possibilità di qualche pioggia
qualche pioggia

Output

chance of weak precipitations .
rainfalls

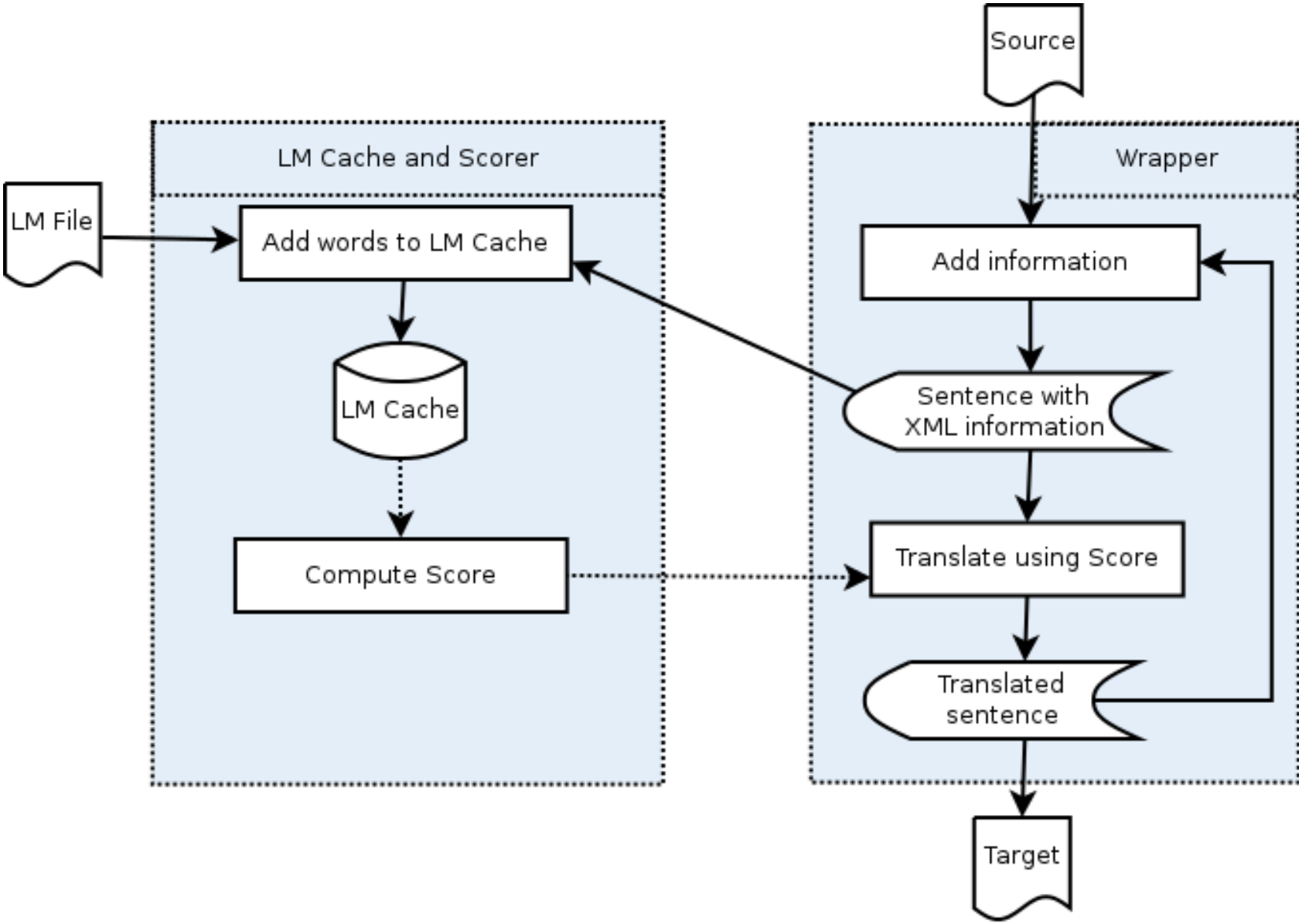
Desired Output

chance of weak precipitations .
some precipitation

Cache-Based Model

- Translate sentence by sentence using a Moses phrase-based system
- Cache unigrams from best translation of previously translated sentences
- At decoding, if word is found in the cache, add reward
- Designed as a generic framework:
  - Can be extended to the phrase-level
  - Can be used for topic and translation models
- Implemented LM Cache
- Method selected for simplicity - given time constraints

System Process Flow



Wrapper

- Manages the translation process
- Takes unigrams from the sentence translation and formats XML input for the LM Cache
- Possible extensions:
  - Filtering to include only content words
  - Using confidence estimation

Interface

- Between LM Cache / Scorer and Wrapper
- XML format: vector of strings from target translation
- E.g. Same weight: <dlt trg="rain||rainfalls"/> pioggia
- E.g. Different weights: <dlt trg="rain"/> <dlt trg="rainfalls"/> pioggia

LM Cache and Scorer

- Cache:
  - Stores unigrams with an age and score
  - Score decays exponentially as age increases
  - Can be initialised from a file e.g. with topic words etc.
  - Filled dynamically with unigrams from translation output of previous sentences **or** post-edits
- Scorer:
  - Checks cache for presence of words
  - Computes score for current sentence
  - Integrated as a feature function in the log linear model

Limitations

- Not **yet** thread-safe
- LM Cache only contains unigrams
- No filtering of unigrams
- Risk of error propagation - can be mitigated by a static load to initialise the LM Cache

Experimental Setup

- Italian -> English weather reports
- Data is repetitive and contains ambiguous words
- Test 3 scenarios in which lexical choice may be influenced:
  - Standard baseline
  - Using an inline suggestion - could be from previous sentence translations, etc.
  - Start with initialised LM Cache - from file

Scenario 1

Scenario: Standard baseline

Input: possibilità di qualche pioggia

chance of weak precipitations . (-15.0119)
chance of rainfalls . (-16.0039)
chance of weak rainfalls . (-16.4628)
the chance of rainfalls . (-16.6108)
chance of rain . (-16.9722)
rainfalls are likely . (-17.1521)
the chance of some rain . (-17.4136)
light rainfalls . (-17.4729)
a chance of rainfalls . (-17.564)
likelihood of rainfalls . (-17.5873)

Scenario 2

Scenario: Using a inline suggestion

Input: <dlt -trg="rainfalls"/>con la possibilità di qualche pioggia

chance of rainfalls . (-14.6448)
chance of weak precipitations . (-15.0119)
chance of weak rainfalls . (-15.1037)
the chance of rainfalls . (-15.2517)
rainfalls are likely . (-15.7929)
light rainfalls . (-16.1138)
a chance of rainfalls . (-16.2048)
likelihood of rainfalls . (-16.2281)
some rainfalls . (-16.3367)
possible rainfalls . (-16.4999)

Scenario 3

Scenario: Start with initialised LM Cache - file contains suggestion "rainfalls"

Input: possibilità di qualche pioggia

chance of rainfalls . (-14.6448)
chance of weak precipitations . (-15.0119)
chance of weak rainfalls . (-15.1037)
the chance of rainfalls . (-15.2517)
rainfalls are likely . (-15.7929)
light rainfalls . (-16.1138)
a chance of rainfalls . (-16.2048)
likelihood of rainfalls . (-16.2281)
some rainfalls . (-16.3367)
possible rainfalls . (-16.4999)

Re-cap (1)

- Designed and developed a generic framework for document-level decoding
- Applied framework to problem of lexical consistency
- Implemented a LM Cache for unigrams
- Wrapper used to provide suggestions to influence translation

Re-cap (2)

N-Best of the baseline for "qualche pioggia"

rainfalls (-14.5073)
rain (-14.5336)
some rain (-16.434)
weak rain (-16.8874)
some precipitation (-16.9085)

N-Best of the wrapper

rainfalls (-14.5073)
rain (-14.5336)
some precipitation (-15.5494)
some rain (-16.434)
light precipitation (-16.5994)

Re-cap (3)

- Possible extensions to Translation Models, Topic Models, n-grams, filtering
- Lots left to do...

Code Available

`https://github.com/moses-smt/mosesdecoder/tree/moses_cachebased`